Physics and: teacher support

An Institute of Physics briefing note

RICHARD LEWIS

The Institute of Physics devised and set up the Stimulating Physics Network (SPN), funded by the Department for Education, to support teachers of physics in state schools in England and improve the quality of physics teaching.

One of its aims is to increase the number of students continuing with physics at post-16 level, which had dramatically declined since 1990 and only began to rise again in 2007. One of the reasons for the fall is thought to be the loss of a culture of physics in schools due to the lower numbers of specialist physics teachers.

IOP is working alongside the Department for Education to increase the number of specialists, but getting up to a full complement looks to be another decade away even with current record highs in recruitment. In the meantime, SPN is an effective way of getting the best out of teachers, and particularly those without a specialist background in physics – helping them to inspire their students to study physics further.

SPN is based on a team of 35 teaching and learning coaches who work closely with nonspecialists teaching physics in around 400 selected partner schools, while the work of our Physics Network Coordinators is available to all secondary schools.

The data show it works – the partner schools with which we've been working are sending increasing number of pupils on to study physics post-16 – not only positive in itself, but also a general indicator of good practice and a good experience for all students.

There are still other schools with whom we have not yet worked but who would benefit from the support that SPN provides. Expanding it to those schools after the current funding period ends would help to ensure the number of A-level physics students continues to increase – and that the UK has the science and maths skills that it needs.

Prof. Sir Peter Knight
President, Institute of Physics

Stimulating Physics works

From addressing engineering challenges such as those created by climate change to working in the growth industry of computer games, the high-tech economy of the future will see more and more jobs requiring people with skills in science and maths.

Even for those who take an A-level in physics but don't end up using it in the workplace, it's a "facilitating" subject looked upon favourably by universities when considering students' applications to a variety of other courses. And having a public that is well-informed about physics is worthwhile for its own sake.

But in 2007, the number of students choosing to study physics at post-16 level reached rock bottom – only 27,466 took A-level physics that year, compared to 45,000 in 1990.

There is also a clear gender gap – this year physics was the second most popular A-level subject choice for boys but only 17th most popular for girls. Only around a fifth of A-level physics students are girls, and almost half of state secondary schools send no girls on to do physics A-level.

There is a clear gender gap: physics is the second most popular A-level subject for boys but only 17th most popular choice for girls.

Although numbers are steadily increasing again, with 35,569 sitting the A-level this year, it still isn't enough to meet the demands of employers in a high-tech economy – a survey by the CBI in 2011 found that 43% of employers struggled to recruit people with adequate skills in science and maths.

Part of the problem is thought to be in physics teaching. Before SPN began, around 500 state schools in England had no specialist physics teacher at all and overall, only about a fifth of science teachers were physics specialists, when there should be a third each of physicists, biologists and chemists. Put another way, the total number of specialist physics teachers is only 60% of what would be considered "full strength".

Thanks to schemes such as the Institute's teacher-training scholarships, funded by the Department for Education, more top physics graduates are choosing to enter the teaching profession. But even with a current recruitment high, there is likely to be a shortage of specialist physics teachers for another decade or more.

In the meantime, the Stimulating Physics Network (SPN), established by the Institute and

One of the aims of the Stimulating Physics Network is more girls studying physics

the Science Learning Centres and primarily funded by the Department for Education, is addressing the problem by working with those teaching physics – particularly those from a biology or chemistry background – to increase their confidence and enthusiasm and, ultimately, their effectiveness. Long-term support for teachers is an effective way of improving pupils' learning experiences over a sustained period, and therefore increases uptake at A-level.

SPN provides continuing professional development to teachers of physics in 420 state secondary schools in England that were identified as having low progression to physics at post-16. These partner schools receive tailored support for two years from IOP's 35 teaching and learning coaches. Teachers in the partner schools benefit from local networking to share experiences and ideas, and have the opportunity to attend an annual summer school.

SPN also provides mentoring support to newly qualified teachers to improve their teaching repertoire and confidence, and also to improve retention rates – half of physics teachers have been leaving the profession within four and a half years.

Data from the National Pupil Database show that SPN is working. The increase in the number of people progressing from Key Stage 4 to AS level physics is happening at more than double the rate in SPN partner schools. The rate of increase is also higher for girls than it is for boys, suggesting that SPN has been highly successful in addressing the longstanding gender-gap problem.

A higher proportion of pupils in partner schools are entered for triple-science GCSEs than in other schools, and the percentage of those getting the highest grades in GCSE physics is also higher. These figures are all the more remarkable when considering that SPN schools tend to have more pupils eligible for free school meals – an indicator of socioeconomic disadvantage that is correlated with lower academic achievement.

SPN is a successful programme that is making good progress towards the important goal of increasing the uptake of physics at AS and A level. In the schools with which IOP has worked, it's meeting the need that it was established to address. But there are still other schools with low progression to A-level physics that would benefit from the support that SPN provides – of 2679 non-SPN schools, around 1500 send fewer than 12 pupils on to study physics post-16.

Expanding the programme after its current funding period ends in 2014 would allow SPN to widen its net and reach those schools. More teachers would reach a higher standard of expertise. More pupils would have a good experience of physics at school and choose to continue with the subject at post-16 level – ensuring the UK has the base of science and maths skills it will need for the future.

The increase in students progressing to physics at post-16 from SPN schools is double that in non-partner schools

Stimulating Physics aims to give all students a better experience of physics in school

IN FIGURES

- In 2012 compared to 2011, the overall number of pupils going on to study AS physics increased by 9.63% in the schools with which SPN has been working the longest, compared to 4.64% in non-partner schools.
- For girls the figures were 16.53% compared to 7.19% – again more than double the rate of increase.
- 25.25% of pupils in the schools partnered with SPN the longest were entered for triple-science GCSEs in 2012. In non-partner schools only 21.07% took triple science.
- 33.67% of pupils in the 2010–2012 cohort of SPN schools got A or A* grades in physics GCSE compared to 30.93% in non-SPN schools.
- For grades A*–C the numbers are 82.06% and 69.48% respectively.
- 17.97% of pupils in all SPN partner schools are eligible for free school meals – traditionally correlated with lower academic performance – compared with 15.77% of those in non-SPN schools.
- 38,650 teacher-hours of physics continuing professional development were delivered through SPN between 1 April 2012 and 31 March 2013.
- 37,411 pupils experienced SPN engagement activities during the same period.
- 92% of teachers in SPN partner schools report an increase in confidence and 97% say that SPN workshops positively impact their classroom practice.
- Of the 2679 English state schools with which SPN has not yet worked, around 1500 send fewer than 12 pupils on to study physics post-16.
- SPN receives £1.85 m a year in funding from the Department for Education, and a further £250,000 a year from IOP.

"Last year a newly qualified teacher and I shared a sixth-form group and by using the methods [the Teaching and Learning coach had] shown me, we were able to help our students get some of the best A-level results in the school."
Mark Nicolaides, head of physics, the Purbeck School, Dorset

"We had full retention to A2 (and decent grades) and recruited 11 good students to AS, so [we are] improving. SPN gave us a boost when we needed to raise the physics profile."
John Cloke, Ullswater School, Cumbria